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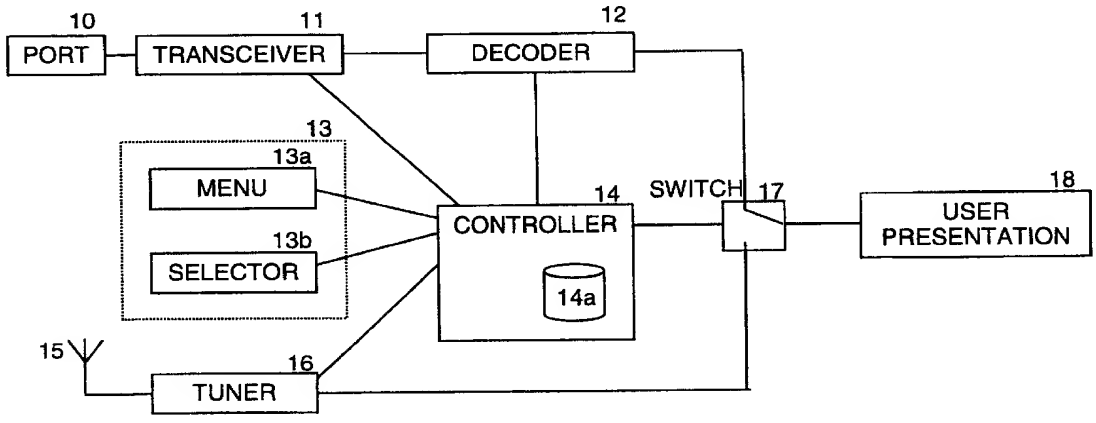
(54) Title: INTERNET ENABLED BROADCAST RECEIVING APPARATUS



(57) Abstract: A broadcast receiving apparatus, related apparatus and operation methods, and broadcast and telecommunications signals arranged to support selection and receipt of both radio frequency broadcast and internet data in a single device. Selection and presentation of radio frequency broadcast signals can be made responsive to the internet data; and selection and presentation of internet data can be made responsive to the radio frequency broadcast signals. Where the internet data is a webcast channel, handoff between radio frequency broadcast and webcast channels may be automated using information carried in broadcasts and/or telecommunications signals or both.

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INTERNET-ENABLED BROADCAST RECEIVING APPARATUS

FIELD OF THE INVENTION

The present invention relates to an broadcast receiving apparatus, method, and software for receiving both radio-frequency public broadcast signals and signals transmitted via a telecommunications network, corresponding transmitter systems, and transmitted signals, a systems incorporating the same.

BACKGROUND TO THE INVENTION

Public broadcast of for example television and radio signals utilising frequency modulation (FM) and/or amplitude modulation (AM) is well known. Domestic receivers for such signals are also well known and include television sets, video receiver/recorders, and a wide range of radio receivers. Such receivers typically comprise an in-built antenna to receive the signals, but this requires that the set be within range of a broadcast antenna broadcasting on a frequency capable of being received by the set. However broadcast of any given channel is typically geographically constrained limited both by the availability of suitable broadcast antennas, and regulatory approval to broadcast at a given frequency within a given geographic area. Increasing numbers of listeners/viewers take an interest in receiving local broadcast stations whether because of an interest in local issues, or because the local station addresses a particular interest group.

A problem with the present arrangement is that where listeners/viewers move out of the broadcast area associated with such stations, whether temporarily by, for example, travelling on business or more permanently by, for example, moving home to a new area, then the listeners will no longer be able to receive the broadcasts.

More recently some formerly broadcast-only channels have become available via the Internet. In such an arrangement a personal computer is programmed to receive a digital signal stream via a telephone line to the home/office. The personal computer receives and decodes a signal and plays the received signal via the computer screen and/or loudspeakers. A wide range of formerly broadcast-only channels are available via the Internet in this way, as are an increasing number of "channels" which are available only on the Internet. These

latter take advantage of the fact that such distribution via the Internet does not require a regulatory broadcast licence.

However a disadvantage with such an Internet radio arrangement is that it requires a fully functional personal computer typically with large display, keyboard etc. These are typically much more expensive than a conventional broadcast radio receiver to which consumers are accustomed.

OBJECT OF THE INVENTION

The invention seeks to provide an improved apparatus and method for receipt of public broadcast and Internet broadcast channels and which mitigates the problems associated with the prior art.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention there is provided a broadcast receiving apparatus comprising: first apparatus arranged to receive radio frequency broadcast signals; and second apparatus arranged to transmit and receive telecommunications signals over a telecommunications link; wherein a second signal received by one of the first and second apparatuses is presented to a user responsive to a characteristic of a first signal received by the other of the first and second apparatuses.

In a preferred embodiment the broadcast receiving apparatus additionally comprises: a electronic storage device; and the second signal is presented to the user responsive to pre-determined data stored in the electronic storage device.

In a further preferred embodiment the first signal is one of the radio frequency broadcast signals; and the characteristic is received signal strength.

In a further preferred embodiment the first signal is one of the radio frequency broadcast signals; and the characteristic is radio frequency broadcast signal content indicative of an internet address.

Preferably, the radio frequency broadcast signal content indicative of an internet address comprises at least one of radio frequency broadcast channel identification data, an internet address, and a URL.

Preferably, the radio frequency broadcast signal content is encoded as Radio Data System (RDS) data.

Preferably, the telecommunications signals are an internet broadcast channel.

Preferably, the first signal is one of the telecommunications signals; and the characteristic is telecommunications signal content indicative of a radio frequency broadcast signal.

Preferably, the second signal is presented to user responsive to an indication of the location of the broadcast receiving apparatus.

Preferably, the telecommunications link is a fixed access telecommunications link.

Preferably, the wireless telecommunications link is a mobile access telecommunications link.

Advantageously, use of a wireless link facilitates mobile use of the receiver apparatus.

Advantageously the apparatus can be used to receive broadcast channels (whether broadcast as radio frequency signals or webcast signals) whether or not in range of a radio frequency broadcast transmitter, or whether or not a network connection is available.

The invention also provides for a system for the purposes of telecommunications which comprises one or more instances of apparatus embodying the present invention, together with other additional apparatus.

According to a second aspect of the present invention there is provided a telecommunications system comprising broadcast receiving apparatus according to the first aspect.

According to a third aspect of the present invention there is provided a radio-frequency broadcast transmission apparatus comprising: apparatus arranged to broadcast data associated with broadcast channel content on that broadcast channel and in which the data comprises an indication of an internet address associated with that radio frequency broadcast channel.

Preferably, the internet address is indicative of a webcast channel.

Preferably, the indication of an internet address comprises an indication of an internet address and channel identification data associated with the broadcast.

According to a fourth aspect of the present invention there is provided a radio frequency broadcast system comprising radio frequency broadcast transmission apparatus according to the third aspect.

According to a fifth aspect of the present invention there is provided a radio frequency broadcast signal carrying broadcast channel content and an indication of an internet address associated with the broadcast channel content.

Preferably, the indication is indicative of a webcast channel.

The invention is also directed to methods by which the apparatus operates and including method steps for carrying out every function of the apparatus:

According to a sixth aspect of the present invention there is provided a method of operating broadcast receiving apparatus comprising: first apparatus arranged to receive a radio frequency broadcast signals; and second apparatus arranged to transmit and receive telecommunications signals over a telecommunications link; the method comprising the steps of: receiving a first signal at one of the first and second apparatuses; presenting to a user of the apparatus, and responsive to the first signal, a second signal received at the other of the first and second apparatuses.

According to a seventh aspect of the present invention there is provided a method of effecting handoff between a radio frequency broadcast and a telecommunications link comprising the steps of: receiving a radio frequency broadcast signal comprising a broadcast channel and associated data indicative of an associated internet address; requesting, responsive to the internet address, a download of data over the telecommunications link.

According to a eighth aspect of the present invention there is provided a method of effecting handoff between a telecommunications link and a radio frequency broadcast receiver comprising the steps of: receiving a webcast channel over the telecommunications link, together with associated data indicative of an associated broadcast channel; tuning the radio frequency broadcast receiver to a broadcast channel responsive to the data indicative of an associated broadcast channel.

According to a ninth aspect of the present invention there is provided a method of operating a broadcast receiving apparatus comprising first apparatus arranged so as in a first mode to enable selection and receipt of a radio frequency broadcast channel, and second apparatus arranged so as in a second mode to enable selection and receipt of a webcast channel over a telecommunications link, said method comprising the steps of: selecting a first channel in a first of said modes; selecting a second channel in a second of said modes.

Advantageously, switching between modes can take place without user intervention.

Advantageously, switching between modes can take place without user intervention.

The invention is also directed to a program for a computer, comprising components arranged to perform each of the method steps:

According to a tenth aspect of the present invention there is provided control software on a computer readable medium for a broadcast receiving apparatus comprising: first apparatus arranged to receive a radio frequency broadcast signals; and second apparatus arranged to transmit and receive telecommunications signals over a telecommunications link; the software being arranged to perform the steps of: monitoring a characteristic of a first signal received by one of the first and second apparatuses; presenting to a user a second signal received by the other of the first and second apparatuses responsive to the characteristic.

The preferred features may be combined as appropriate, as would be apparent to a skilled person, and may be combined with any of the aspects of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to show how the invention may be carried into effect, embodiments of the invention are now described below by way of example only and with reference to the accompanying figures in which:

Figure 1 shows an example of a block circuit diagram of a first embodiment of apparatus in accordance with the present invention;

Figure 2 shows a first example of how apparatus in accordance with the present invention would receive Internet and/or public broadcast channels;

Figure 3 shows a second example of how a receiver in accordance with the present invention would receive Internet and/or public broadcast channels.

Figure 4 shows an example of a block circuit diagram of a further embodiment of apparatus in accordance with the present invention;

Figures 5 and 6 shows high level flow diagrams of methods in accordance with the present invention.

DETAILED DESCRIPTION OF INVENTION

Referring now to Figure 1, there is shown a block circuit diagram of a Internet enabled broadcast receiving apparatus. The receiving apparatus comprises a network port 10, transceiver 11, decoder 12, channel selection apparatus 13, controller 14 (comprising some data storage capacity 14a), broadcast receiving antenna 15, tuner 16, switching function 17, and user presentation device 18.

In a first embodiment, the user presentation device 18 is switchably connected 17 at any one time either to an output from the tuner 16 or an output from the decoder 12. The tuner is connected to and receives broadcast signals via antenna 15. Decoder 12 is connected via the transceiver 11 to the network port 10 via which it receives signals when the port is connected to a suitable network (for example the Internet). The controller 14 is connected to the transceiver 11, decoder 12, switch 17, and tuner 16. The channel selector 13 comprises a menu presentation apparatus 13a (for example a small liquid crystal display) and apparatus 13b for selecting items from a menu (for example user operable buttons to pan up and down through a menu and to confirm selection of a specific displayed item in such a menu). The selector 13b may also include apparatus for selecting whether to receive public broadcast signals or Internet broadcast signals.

The apparatus is arranged to operate in one of two modes: in a first mode as a conventional public broadcast receiver; in a second mode as an Internet broadcast ("Webcast") receiver.

In the first mode the apparatus operates as a conventional public broadcast receiving device. The menu display 13a shows an indication of the channel currently tuned to whilst selector buttons 13b allow the user to scan available

frequencies for retuning to another channel. The controller conveys the selection to the tuner and toggles the switch 17 to connect the output from the tuner 16 to the user presentation device.

In a second mode, the menu presentation device 13a presents to a user one or more menus which enable the user by means of the selector device 13b to select an Internet broadcast channel for reception. Once a specific channel has been selected, the controller causes a signal to be send via transceiver 11 and network port 10 to request receipt of the selected channel from the network. The subsequently received signal is received at port 10 and conveyed via transceiver 11 to a decoder 12 (for example in the form of a digital to analogue converter) the output signal of which is fed via switch 17 to the user presentation device 18.

The specific arrangement described assumes that the tuner is arranged to output an analogue signal to the user presentation device. However where for example the tuner is arranged to output digital signals and/or the user presentation device is arranged to receive digital signals, then decoder 12 may be removed or additional digital to analogue and analogue to digital converters inserted in the circuit as would be apparent to one skilled in the art.

The menus presented to the user 13a may either be flat (that is, a single listing of all available channels) or, preferably, structured in hierarchical fashion to simplify navigation. For example a first menu presented to the user may allow selection of a geographical area in the world, selection of which leads to presentation of a second menu listing countries within that geographical area, selection of one of which leads to a third menu which lists individual stations transmitted from the selected country. The present invention is not however restricted to such a structuring and alternative structurings could also be applied, for example according to type of transmission (for example jazz, blues, classical, early music, etc.).

Whether the menus are flat or structured, they may be stored locally within the controller apparatus 14 or downloaded on demand via network port 10. In a preferred embodiment menus may be downloaded from the network but are also cached within the controller apparatus 14. In this way a listener may select a channel details of which are retained in the cache, even though a local network menu server is unavailable, provided the preferred channel itself is nevertheless still available via the network.

In one particular embodiment a history menu of recently selected channels may be stored within the controller 14. This allows a user to reselect a recently selected channel directly from the history menu, without having to renavigate the main menus.

Storage means within the controller apparatus 14 may also be used in conjunction with the display apparatus 13a and selector apparatus 13b to allow the user to "bookmark" selected channels whereby to create a personal, customized menu for future use.

The user interface 13 may also comprise programmable preset buttons which user may programme automatically to select radio frequency broadcast channels, or internet broadcast channels.

Referring now to Figure 2, there is shown an example of how such an Internet enabled broadcast receiving apparatus would be used in practice.

The arrangement shows an internet distribution network 29 having a number of access switches 26, 27, 28 to which both internet broadcasters 21, 22 and receivers 20, 20a are connected. The arrangement also comprises public broadcasters 21, 23 connected via broadcast antenna 24, 25, to receivers 20 20a. The arrangement shows an IP only broadcaster 22, a public broadcast only broadcaster 23, and a broadcaster 21 providing both public broadcast and IP broadcast.

The Internet Enabled Broadcast Receiving Apparatus (IEBRA) 20 is shown connected to access switch 27. IEBRA 20 is also connected to the broadcast antenna 24 by means of a broadcast link 24b, the IEBRA 20 lying within the broadcast range 24a of antenna 24. The IEBRA 20 is therefore able to receive broadcasts from broadcaster 21 either via a conventional public broadcast link 24b or as an internet broadcast transmitted over the internet 29. The receiving apparatus can also, in this arrangement, receive internet-only broadcasts over the internet from internet only broadcaster 22. The receiver cannot receive broadcasts from the public broadcast only broadcaster 23 since the receiving apparatus falls outside the maximum range 25a of that broadcaster's transmitting antenna 25.

If the user of the IEBRA 20 were to relocate to the position of IEBRA 20a, then he would be in a position to receive broadcasts from broadcaster 23 via antenna 25. However by virtue of the internet enabling aspect of the apparatus, the IEBRA 20a may also be directly connected via an access network to an access

switch 28 on the internet 29. Despite having moved out of the public broadcast range of broadcaster 21, the receiving apparatus 20a may still be used to receive transmissions from broadcaster 21 via the internet 29 so that the user can still listen to a favourite channel using the same receiving apparatus.

If the IEBRA 20 is relocated to a location where it is not possible to connect to the internet, then the apparatus continues to function as a public broadcast receiving apparatus. Conversely in areas of poor FM/AM broadcast reception, the apparatus can be used primarily for internet broadcast reception.

Referring now to Figure 3 there is shown a further scenario in which an IEBRA may be used to advantage. In this arrangement the IEBRA 31 comprises a broadcast receiving antenna 37 and a wireless communications antenna 36. In this arrangement transceiver 11 is arranged to support wireless telephony transmissions (for example GSM).

In the arrangement of Figure 3 wireless basestations 34, 35 are connected to a mobile switch 36 which is in turn connected to the internet 29. The IEBRA (31a, 31b) is able to use its wireless communications antenna 36 to request and receive webcast information from entities in the internet 29 via the wireless basestations.

In a first location 31, the receiver is within the maximum range 32a of broadcast antenna 32 and receives public broadcast signals 32b via an FM/AM antenna 37. The IEBRA 31 in this scenario is however portable or located, for example, in a motor vehicle and while in operation moves through a series of locations 31, 31a, 31b, 31c. In location 31c the IEBRA is located within the maximum range 33a of a second broadcast antenna 33 and can receive broadcast signals 33b on its public broadcast receiving antenna 37.

However while in transit 31a, 31b the receiver lies outside the maximum ranges of either of these broadcast antennas. In a conventional public broadcast receiving apparatus, the receiver would be unable to receive signals from either broadcast antenna 32, 33 or receive at best a seriously degraded signal. In the present arrangement the IEBRA monitors the quality of the signal received from the broadcast antenna 32. In a conventional car radio arrangement the receiver would make use of Radio Data System (RDS) data received from a broadcast antenna to seek an alternative broadcast antenna 33 from which to receive signals, and effect handover. RDS data comprises signals containing information about the location and operation of broadcast antennas for example, and may

also contain indications of alternative frequencies on which a given channel may be received from adjacent broadcast antennas, along with a channel identifier information, typically used for display to a user. This data is broadcast together with main channel content that is for display to a user as is know in the art. In some cases however, as in the situation illustrated, the receiver 31a, 31b may find itself in an area not served by a broadcast antenna from which to receive a continued broadcast of the same channel. Where this is the case the IEBRA, rather than tune to an arbitrary public broadcast station, switches to an internet broadcast mode and makes a connection 34a with a mobile telephony basestation 34 whereby to continue to receive the same broadcast channel, but by means of the internet 29 accessed via a radio link 34a. Information identifying an internet channel associated with a given radio frequency broadcast channel may be communicated to the receiving apparatus by means of the RDS. In addition to providing the receiving apparatus with details of the received broadcast channel's name, and alternative frequencies on which the same broadcast channel can be received from nearby broadcast transmitters, an associated web address may be downloaded over the broadcast channel to the receiver.

As the receiver continues to move from location 31a to 31b, conventional handoff is effected between telephony basestations 34, 35 so as to allow the user to continue to receive the channel of choice.

By continuing to monitor the strength of public broadcast signals on appropriate frequencies, the receiver 31c may revert to receive public broadcast signals from the broadcast antenna 33 when it moves back within the maximum range 33a of such an antenna. In a preferred arrangement, the receiver scans most recently received RDS information relating to transmission frequencies of the broadcast channel of interest. Regardless of which direction the user is moving away from the previous broadcast antenna 32, he is most likely to move next within range of another broadcast antenna 33 identified in the RDS broadcasts of broadcast antenna 32.

In an alternative embodiment, a suitable processer within the internet 29 identifies the approximate location of the receiver by identifying the wireless basestation 34, 35 with which the receiver is currently communicating. This location information is compared with public broadcast antenna location information and an indication of the frequencies on which a selected internet channel is available by broadcast locally, is transmitted via the wireless basestation to the receiver. The receiver uses this information to scan for an

acceptable quality broadcast signal, switching to receive the broadcast signal when suitable broadcast channel is found.

Since the cost of establishing and maintaining a mobile telephony link 34a, 35a is typically greater than that of receiving public broadcast signals 32b, 33b, the IEBRA preferably comprises some means to indicate to the user whether the receiver is operating in public broadcast receipt mode or mobile telephony signal receipt mode. This may take the form of a visual indication (for example an LED illuminated while in mobile telephony mode) or an audio indication (for example an "bleep" on change of mode, and/or a periodic "bleep" while in mobile telephony operation, though the latter may be less desirable to the user – in a preferred embodiment, the user may switch off the audio indication). Where the receiver is arranged to receive video signals, the indication may form part of the image displayed to the user.

Clearly a single IEBRA may comprise both a wireless internet transceiver arrangement and a fixed access internet radio transceiver arrangement for greatest flexibility.

The simplest method (from the users point of view) of implementing switchover would be for the RDS signal to carry the full URL of the data stream, and for the datastream website to carry the station identifier compatible with the RDS system. In this way, no user input would be required, and the system would be arranged to operate "straight out of the box".

Alternatively, the apparatus may be programmed (either by the user or pre-delivery) with a common web URL which identifies a channel selection service capable of providing connection to one or more Internet broadcast channels. In this arrangement, the RDS system provides not a full URL, but rather just a short indication of the channel being received (e.g. the channel identifier displayed to the user), and this is provided as a parameter to the common web URL. The common web site, as denoted by the common URL, provides the indicated channel upon receipt of the request. This arrangement relies on the provision of such a service by a third party and the maintenance by that party of a mapping from RDS identifier to channel URL.

In a second embodiment, the arrangement is as for the first embodiment with the exception that instead of relying on the RDS system to provide an indication of the relevant URL for each received broadcast channel, the user can allocate a web alternative by entering a web URL (which can be found on the Internet, or

via a phone enquiry, etc.) The URL may be input, for example, by means of the channel selector interface 13 using a similar simple menu system, or alternatively by means of a link (cable or infra-red for example) to a dedicated keyboard or laptop/pocket computer. The URL is stored and associated with one or more specific channel identifiers (as provided by an RDS system) or with specific channel frequencies.

Once this association between channel and URL has been established, the in-car unit uses the station identifier as a key which relates the broadcast channel to the web address. Note also that the conventional workings of RDS will automatically indicate other frequencies associated with the chosen channel as, for example, the radio is moved around the country in a vehicle. These alternative frequencies may be automatically associated with the URL already entered for the base frequency. In this way, the user only has to enter one URL for each station of interest.

Alternatively, the user may enter a single URL for a number of channels, the URL identifying – as in the first embodiment – a common web site which maintains a list of channel identifiers, along with a direct mapping to specific URLs associated with respective channel identifiers.

In this way, as the broadcast signal strength falls, an Internet data link is established to the common URL associated with the received channel, the station identifier being appended as a parameter to the URL. The service indicated by the common URL automatically directs the request to the appropriate URL for the station identifier provided as the parameter. An advantage of this embodiment is that the user has to enter only one URL which covers several, or all, stations; the disadvantage is that the 'redirection' service has to be kept up to date by a third party.

The manual entry of URLs for stations may be combined with either embodiment, and stations which have out of date URLs on the 'list' page (or URL's that are wrong, or non-existent) can be entered individually as before and can bypass the intermediate lookup.

As road and rail tunnels increasingly carry 'leaky feeder' cables enabling radio transmissions to be received underground, current national radio is increasingly available in some such tunnels. In addition plans are ongoing as regards, for example, GSM feeds for the London Underground rail network. The system described, if built into small personal radio, would allow unrestricted listening in

such situations, both for places like the London Underground, where no radio stations are broadcast, and for receiving stations outside the range available within other tunnels (e.g. local radio).

For a small personal "Wireless Web Wireless", a dedicated ASIC (application specific integrated circuit) may be manufactured with all the appropriate circuitry on it to decode the web radio data stream, and effect the switchover. Such a unit includes a mobile telephone capability, and it may be integrated into a personal radio/web radio/mobile phone unit, designed solely as a hands-free unit to be worn on the belt with earphones and a discreet microphone. A small keypad/display shared with the radio may be provided, but no internal speaker/microphone, since the unit would not be intended for 'handed' operation (i.e. held up to the ear). An infrared (or similar e.g. bluetooth) link may provide connection to a personal computer or PDA, which could be the sole interface for entering telephone numbers and or URLs, in accordance with the three switchover methods described previously. The lack of a keyboard would not be a problem if voice dialling were to be employed, or a remote simple keypad (linked by radio) could be worn on the wrist.

In a third embodiment, illustrated in Figure 5, presentation of conventional radio frequency broadcast channels and Internet broadcast channels to the user is not mutually exclusive. Instead, the identification and use of an internet data source with a radio frequency broadcast channel may be used to allow provision, via an internet connection, of supplementary information associated with that broadcast channel. Switching of radio frequency broadcast channel information and internet data in this embodiment is not mutually exclusive and may be effected by providing separate switching 17a, 17b between the respective receivers and the user presentation device(s) 18. Received signals may be presented 18 to the user both from the broadcast tuner 16 and from the internet transceiver 11: for example the broadcast signals may continue to provide audio output, while an internet download is used to display graphical/textual information (e.g. currently-playing track details, or adverts with the optional capability to order online, etc.) for display to the user. In this embodiment, the initiation of an internet data request may be triggered by receipt of an indication, as part of the RDS data, that further associated information may be found at a specified web address. As described above in other embodiments, a full specific address (URL) may be provided or, alternatively, a short form which may be used as a parameter in conjunction with a previously identified common URL associated with the broadcast channel.

Referring now to Figures 4 and 6 there are shown high levels views of the methods associated with selecting an internet data responsive to broadcast signals, and vice versa. In particular, referring to Figure 5, selection of internet data based on received broadcast signals comprises the broad steps of:

- Receive broadcast channel 50.
- Internet request condition met 52. The condition may be a loss of broadcast signal strength (for example signal strength falls below a pre-defined threshold), or receipt of an indication as part of the broadcast signal, of an internet address.
- Make Internet request 54.
- Begin receipt of internet data 56.
- Present internet data to user (and optionally terminate presentation of broadcast channel to user) 58.

Correspondingly the selection of broadcast signals based on received Internet data comprises the broad steps of:

- Receive internet channel 60.
- Broadcast channel receipt condition met 62. The condition may be, for example, restoration of signal strength of a broadcast channel associated with the internet data (for example the signal strength rises above a pre-determined threshold), or may be an indication as part of the internet data that the broadcast chanel should be presented to the user.
- Terminate receipt of internet data 64.
- Present broadcast channel data to user 66 (and optionally terminate presentation of internet channel).

Thus in this example the internet data transmitted by a webcasting apparatus contains an indication of a broadcast channel. That is, a webcast apparatus is arranged to webcast information about one or more radio broadcast channels broadcast from a broadcast antenna together with webcast channel content intended for display to the user. The information may include one or more broadcast channel frequencies and respective indications of locality where those frequencies operate. Where the receiver also has knowledge of its locality, for

example by incorporating a GPS receiver, the receiver may then select an appropriate broadcast frequency.

In summary, there is provided a broadcast receiving apparatus, related apparatus and operation methods, and broadcast and telecommunications signals arranged to support selection and receipt of both radio frequency broadcast and webcast channels in a single device. The arrangement may be used to access information from the Internet responsive to a characteristic of the received broadcast signal (e.g. received signal strength, RDS data carried with the broadcast channel) and which either supplements or replaces the broadcast signal information. Handoff between radio frequency broadcast channels and webcast channels may be automated using information carried in broadcasts and/or telecommunications signals or both.

The invention is not limited to audio-only broadcast channels but extends to any broadcast channels including, for example, broadcast television with which a suitable channel identification data signal, analogous to RDS and providing similar channel identification signals, is associated.

Any range or device value given herein may be extended or altered without losing the effect sought, as will be apparent to the skilled person for an understanding of the teachings herein.

CLAIMS

1. A broadcast receiving apparatus comprising:

first apparatus arranged to receive radio frequency broadcast signals; and

second apparatus arranged to transmit and receive telecommunications signals over a telecommunications link;

wherein a second signal received by one of the first and second apparatuses is presented to a user responsive to a characteristic of a first signal received by the other of the first and second apparatuses.

2. A broadcast receiving apparatus according to claim 1 additionally comprising:

a electronic storage device;

and in which the second signal is presented to the user responsive to pre-determined data stored in the electronic storage device.

3. A broadcast receiving apparatus according to claim 1 in which the first signal is one of the radio frequency broadcast signals; and the characteristic is received signal strength.

4. A broadcast receiving apparatus according to claim 1 in which: the first signal is one of the radio frequency broadcast signals; and the characteristic is radio frequency broadcast signal content indicative of an internet address.

5. A broadcast receiving apparatus according to claim 4 in which the radio frequency broadcast signal content indicative of an internet address comprises at least one of radio frequency broadcast channel identification data, an internet address, and a URL.

6. A broadcast receiving apparatus according to claim 4 in which the radio frequency broadcast signal content is encoded as Radio Data System (RDS) data.

7. A broadcast receiving apparatus according to claim 1 in which the telecommunications signals are an internet broadcast channel.

8. A broadcast receiving apparatus according to claim 1 in which: the first signal is one of the telecommunications signals; and the characteristic is telecommunications signal content indicative of a radio frequency broadcast signal.

9. A broadcast receiving apparatus according to claim 1 in which the second signal is presented to user responsive to an indication of the location of the broadcast receiving apparatus.

10. A broadcast receiving apparatus according to claim 1 in which the telecommunications link is a fixed access telecommunications link.

11. A broadcast receiving apparatus according to claim 1 wherein said wireless telecommunications link is a mobile access telecommunications link.

12. A telecommunications system comprising broadcast receiving apparatus according to claim 1.

13. A radio-frequency broadcast transmission apparatus comprising:

apparatus arranged to broadcast data associated with broadcast channel content on that broadcast channel and in which the data comprises an indication of an internet address associated with that radio frequency broadcast channel.

14. A radio frequency broadcast transmission apparatus according to claim 13 in which the internet address is indicative of a webcast channel.

15. A radio frequency broadcast transmission apparatus according to claim 13 in which the indication of an internet address comprises an indication of an internet address and channel identification data associated with the broadcast.

16. A radio frequency broadcast system comprising radio frequency broadcast transmission apparatus according to claim 13.

17. A radio frequency broadcast signal carrying broadcast channel content and an indication of an internet address associated with the broadcast channel content.

18. A radio frequency broadcast signal according to claim 17 in which the indication is indicative of a webcast channel.

19. A method of operating broadcast receiving apparatus comprising:

first apparatus arranged to receive radio frequency broadcast signals; and

second apparatus arranged to transmit and receive telecommunications signals over a telecommunications link;

the method comprising the steps of:

receiving a first signal at one of the first and second apparatuses;

presenting to a user of the apparatus, and responsive to the first signal, a second signal received at the other of the first and second apparatuses.

20. A method of effecting handoff between a radio frequency broadcast and a telecommunications link comprising the steps of:

receiving a radio frequency broadcast signal comprising a broadcast channel and associated data indicative of an associated internet address;

requesting, responsive to the internet address, a download of data over the telecommunications link.

21. A method of effecting handoff between a telecommunications link and a radio frequency broadcast receiver comprising the steps of:

receiving a webcast channel over the telecommunications link, together with associated data indicative of an associated broadcast channel;

tuning the radio frequency broadcast receiver to a broadcast channel responsive to the data indicative of an associated broadcast channel.

22. A method of operating a broadcast receiving apparatus comprising first apparatus arranged so as in a first mode to enable selection and receipt of a radio frequency broadcast channel, and second apparatus arranged so as in a second mode to enable selection and receipt of a webcast channel over a telecommunications link, said method comprising the steps of:

selecting a first channel in a first of said modes;

selecting a second channel in a second of said modes.

23. Control software on a computer readable medium for a broadcast receiving apparatus comprising:

first apparatus arranged to receive a radio frequency broadcast signals; and

second apparatus arranged to transmit and receive telecommunications signals over a telecommunications link;

the software being arranged to perform the steps of:

monitor a characteristic of a first signal received by one of the first and second apparatuses;

present to a user a second signal received by the other of the first and second apparatuses responsive to the characteristic.

24. A webcast apparatus arranged to webcast an internet channel and to webcast information about an associated radio broadcast channel as part of the internet channel.

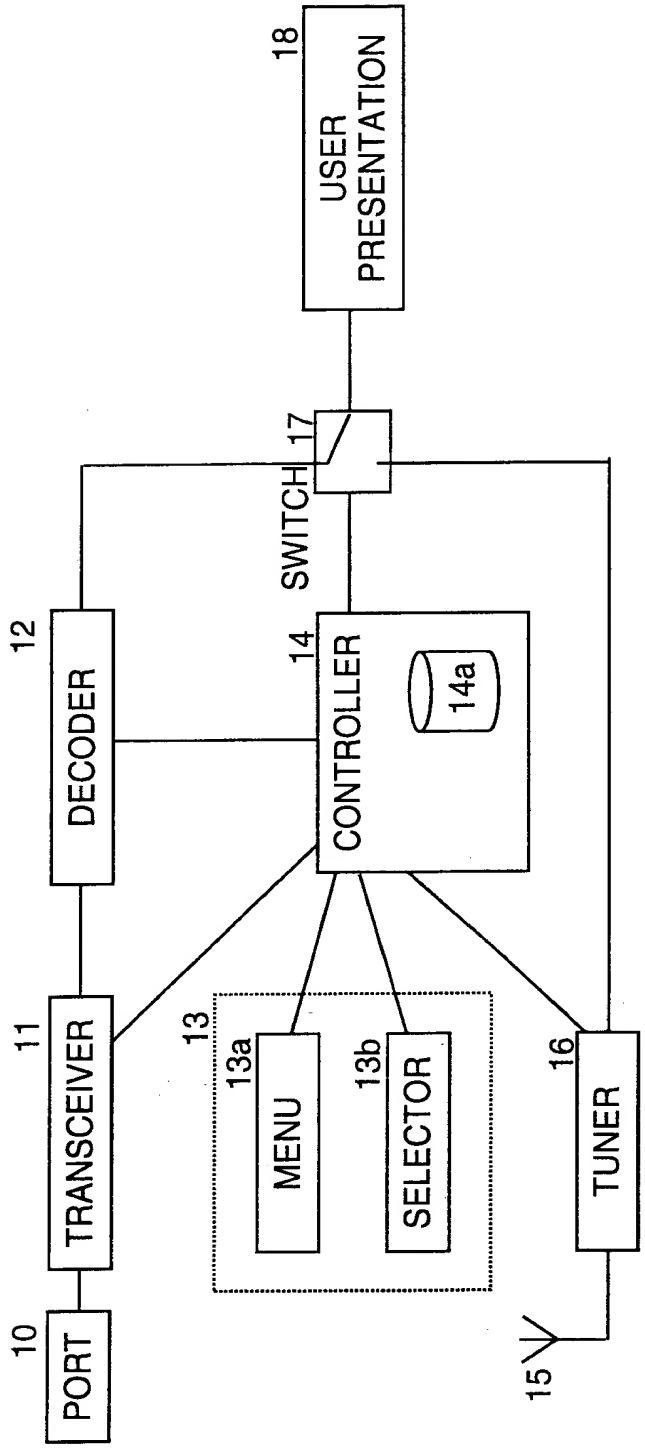
18
USER PRESENTATION
17
SWITCH
12
DECODER
14
CONTROLLER
14a
11
TRANSCEIVER
13
13a
MENU
13b
SELECTOR
16
TUNER
10
PORT
15

Fig. 1

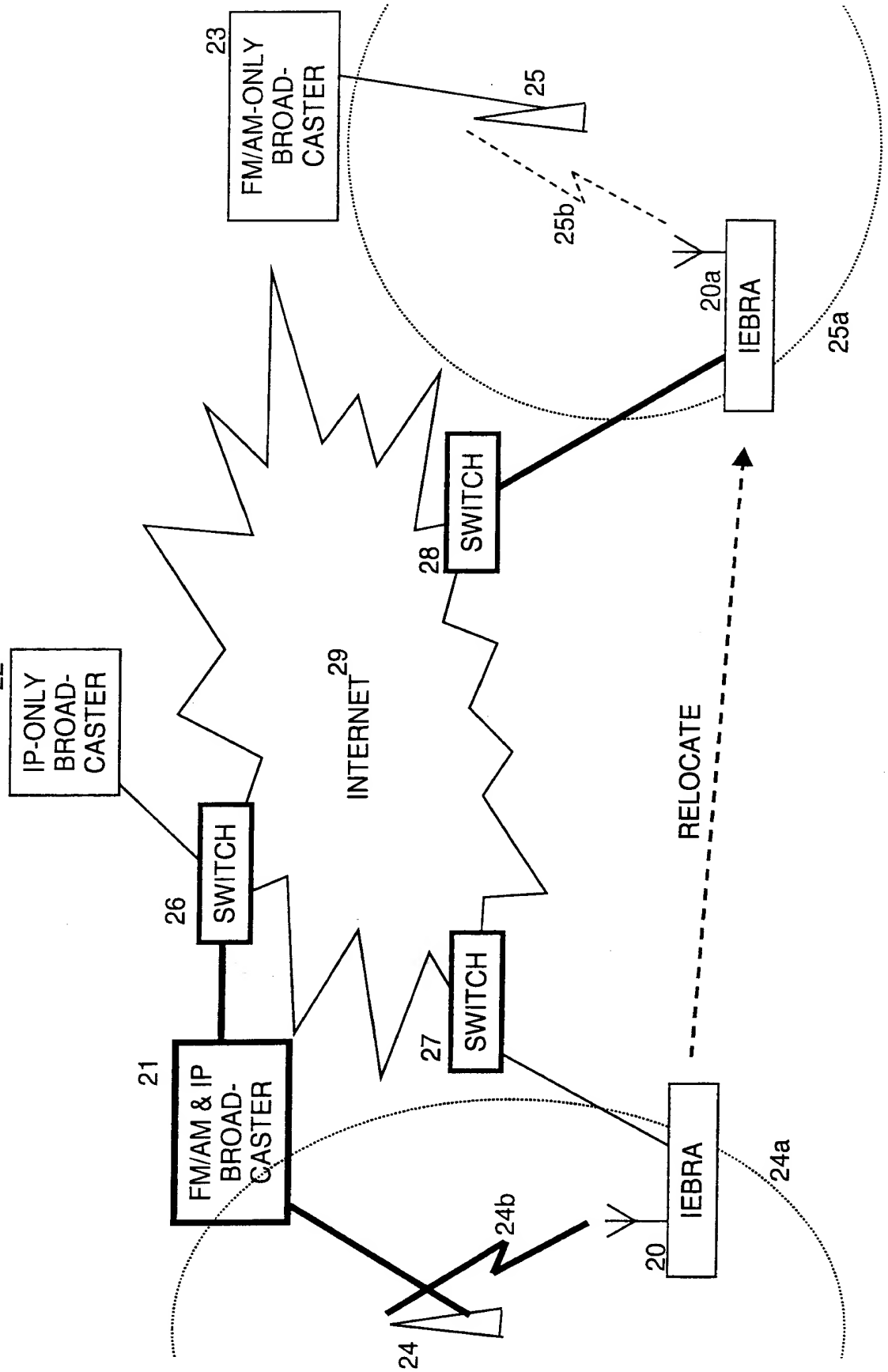
FM/AM & IP BROAD-CASTER
21
IP-ONLY BROAD-CASTER
22
FM/AM-ONLY BROAD-CASTER
23
SWITCH
26
SWITCH
27
SWITCH
28
INTERNET
29
IEBRA
20
IEBRA
20a
24
24b
24a
25
25b
25a
RELOCATE

Fig. 2

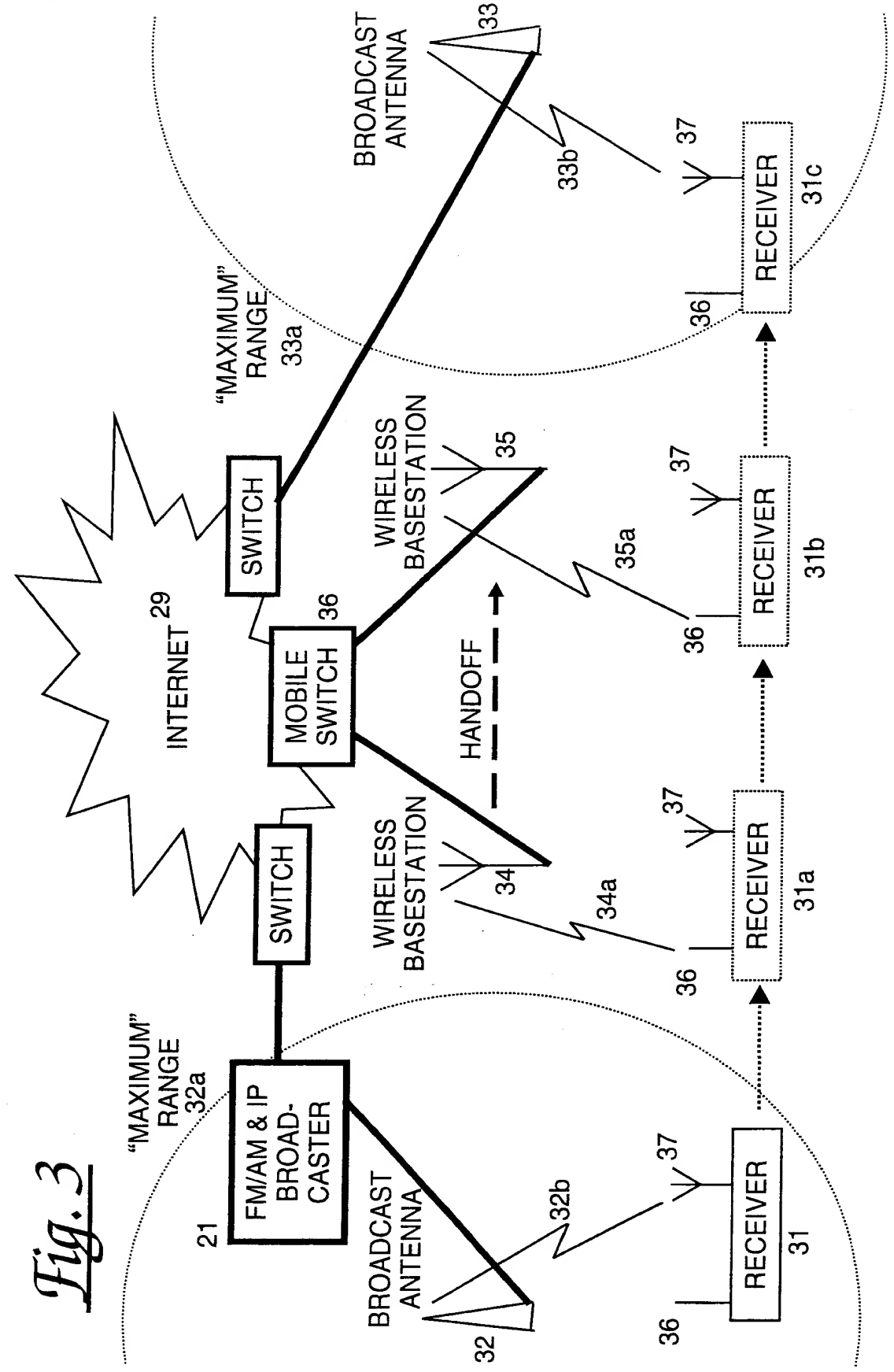
FM/AM & IP BROAD-CASTER
21
SWITCH
SWITCH
INTERNET
29
MOBILE SWITCH
36
WIRELESS BASESTATION
34
WIRELESS BASESTATION
35
HANDOFF
"MAXIMUM" RANGE
32a
"MAXIMUM" RANGE
33a
BROADCAST ANTENNA
32
BROADCAST ANTENNA
33
32b
33b
34a
35a
RECEIVER
31
RECEIVER
31a
RECEIVER
31b
RECEIVER
31c
36
37

Fig. 3

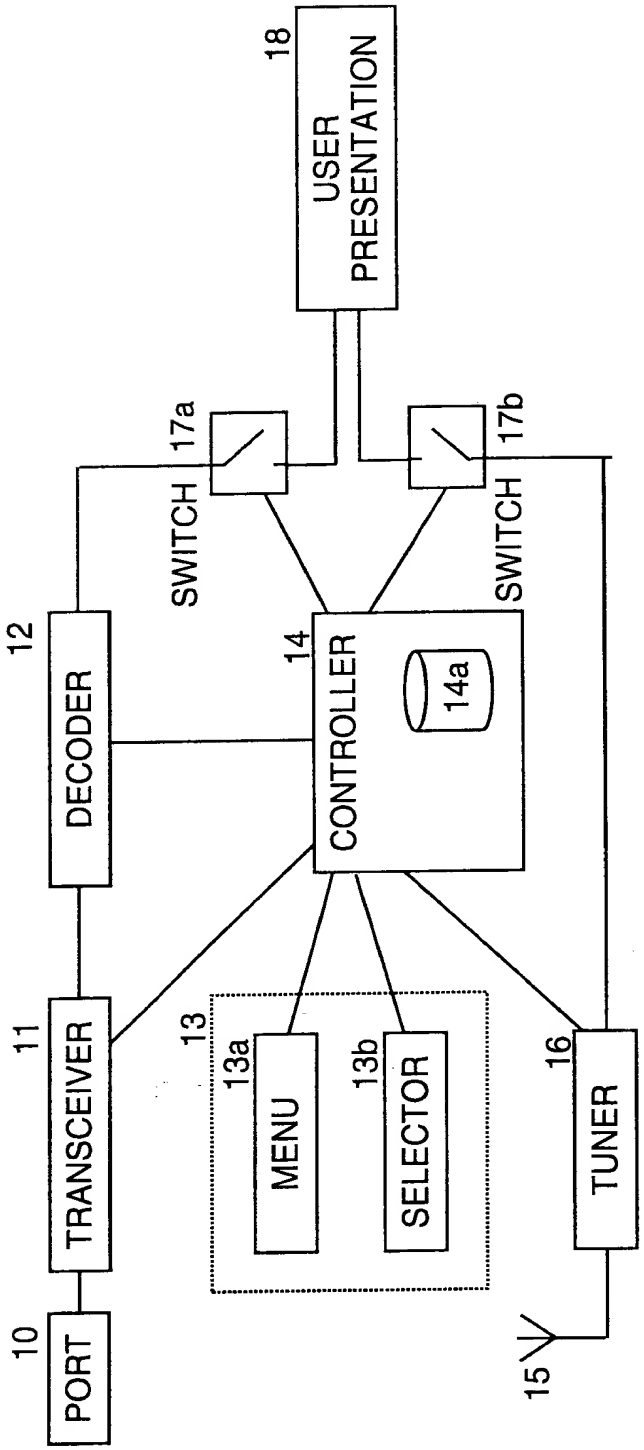
18
USER PRESENTATION
17a
SWITCH
17b
SWITCH
12
DECODER
14
CONTROLLER
14a
11
TRANSCEIVER
13
13a
MENU
13b
SELECTOR
16
TUNER
10
PORT
15

Fig. 4

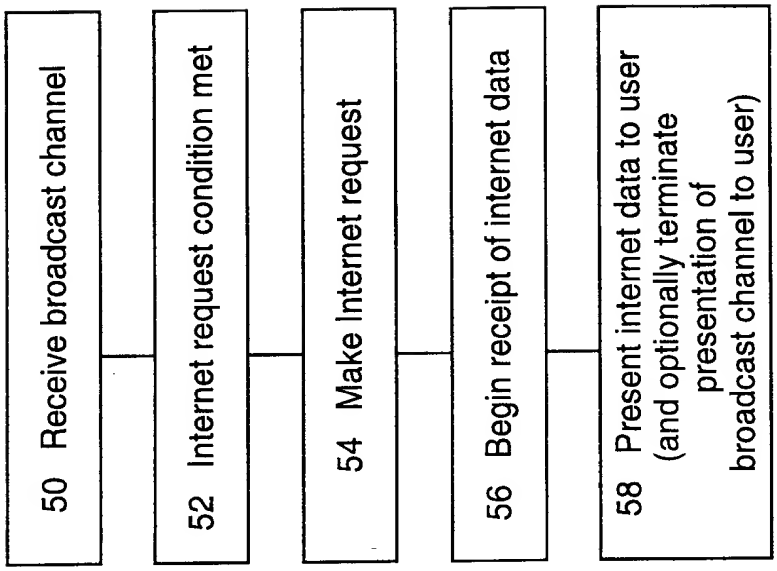
50 Receive broadcast channel
52 Internet request condition met
54 Make Internet request
56 Begin receipt of internet data
58 Present internet data to user (and optionally terminate presentation of broadcast channel to user)

Fig. 5

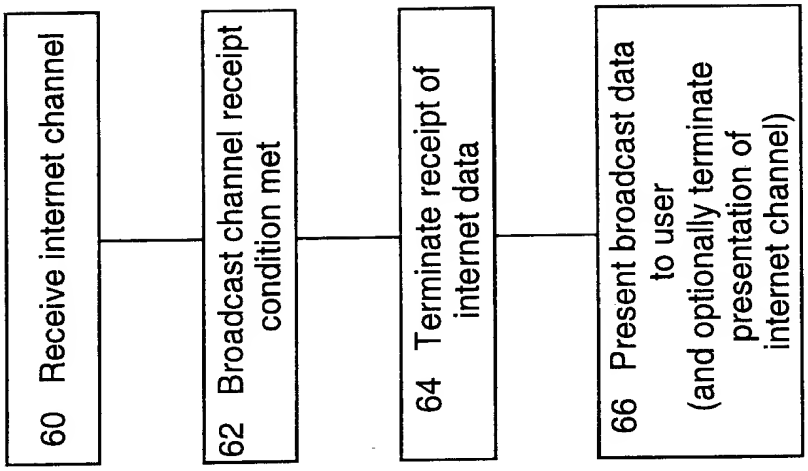
60 Receive internet channel
62 Broadcast channel receipt condition met
64 Terminate receipt of internet data
66 Present broadcast data to user (and optionally terminate presentation of internet channel)

Fig. 6